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ORIGINAL ARTICLE

TIMI score as a predictor of severity of coronary artery disease in patients with STEMI.

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ABSTRACT… Objective: To investigate the TIMI (Thrombolysis in Myocardial Infarction) score as a predictive tool for assessing the severity of coronary artery disease in patients presenting with ST-segment elevation myocardial infarction (STEMI). **Study Design:** Prospective, Observational Cohort study. **Setting:** Hayatabad Medical Complex Peshawar. **Period:** January 2021 to June 2022. **Methods:** Consecutive patients presenting with STEMI to the emergency department of the participating hospital was considered for inclusion. Inclusion criteria were including patients aged 21 years or older, with symptoms consistent with STEMI and ST-segment elevation of at least 1 mm in two or more contiguous leads on the electrocardiogram (ECG). Patients with a known history of coronary artery disease or previous myocardial infarction were excluded from the study. **Results:** The age of the patients ranged widely, with a mean±SD age of 60.18±15.38 years. Gender distribution showed a predominance of males, constituting 67.79% of the sample, while females accounted for 32.20%. In terms of comorbidities, 22.03% of patients were obese, 52.54% had diabetes mellitus, 18.64% had hypertension, 25.42% had hyperlipidemia, 11.86% had a family history of myocardial infarction, and 47.45% were smokers. Moderate risk group shows a lower incidence at 71.11%, and the High risk group has the lowest incidence at 50%. The p-value for this comparison is highly significant at 0.0001, indicating that there is a substantial difference in the occurrence of LV dysfunction among these risk groups. **Conclusion:** Our study demonstrates a strong association between TIMI risk groups and the occurrence of post-myocardial infarction complications, including LV dysfunction, arrhythmias, cardiogenic shock, and death.

Key words: Coronary Artery Disease, ST-segment Elevation Myocardial Infarction, Thrombolysis in Myocardial Infarction.

INTRODUCTION

Cardiovascular diseases continue to be a leading cause of morbidity and mortality worldwide, with acute myocardial infarction (AMI) representing a significant health burden.[1] Among the various types of AMI, ST-segment elevation myocardial infarction (STEMI) stands out as a particularly critical condition characterized by complete occlusion of a coronary artery, often leading to severe myocardial damage and life-threatening complications.[2,3] The accurate assessment of STEMI severity upon presentation is paramount for timely and appropriate management decisions.[4]

One valuable predictive tool that has gained widespread attention and utilization in this context is the Thrombolysis in Myocardial Infarction (TIMI) score. The TIMI score is a validated risk stratification system that integrates various clinical and demographic factors to estimate the likelihood of adverse cardiovascular events in patients with acute coronary syndromes.[5,6]

The Thrombolysis in Myocardial Infarction (TIMI) score has emerged as a widely recognized risk assessment tool, providing a standardized and practical approach for evaluating the likelihood of adverse outcomes in patients with AMI.[7] Initially developed in the context of fibrinolytic therapy, the TIMI score incorporates several clinical and historical variables, such as age, heart rate, blood pressure, and the presence of coronary

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risk factors, to predict the risk of adverse cardiac events following an acute coronary syndrome (ACS).[7,8] Over the years, its prognostic significance has been well-established in different clinical scenarios, contributing to its widespread adoption in clinical practice.[9]

However, the utility of the TIMI score as a predictive tool specifically for assessing the severity of coronary artery disease in patients presenting with STEMI remains an area of ongoing research and debate.[10] While the TIMI score has proven to be a valuable risk assessment tool for ACS patients in general, its ability to reliably predict the extent of coronary artery involvement and the subsequent impact on clinical outcomes in STEMI patients deserves closer scrutiny.[11] The aim of our study is to investigate the TIMI (Thrombolysis in Myocardial Infarction) score as a predictive tool for assessing the severity of coronary artery disease in patients presenting with ST-segment elevation myocardial infarction (STEMI).

METHODS

This prospective, observational cohort study conducted at the Hayatabad Medical Complex Peshawar, on 118 participants. Data was collected from patients admitted with STEMI over a period of 18 months from January 2021 to June 2022.

Study Participants

Consecutive patients presenting with STEMI to the emergency department of the participating hospital was considered for inclusion. Inclusion criteria were including patients aged 21 years or older, with symptoms consistent with STEMI and ST-segment elevation of at least 1 mm in two or more contiguous leads on the electrocardiogram (ECG). Patients with a known history of coronary artery disease or previous myocardial infarction were excluded from the study.

Data Collection

The data, including medical history and comorbidities (diabetes, hypertension, etc.), presenting symptoms and duration of symptoms, vital signs on admission (heart rate, blood pressure, respiratory rate), results of baseline laboratory investigations (troponin levels, creatinine, etc.), angiography findings, encompassing the number and location of coronary artery stenosis, and coronary intervention details (angioplasty, stenting, etc.), were collected by trained research personnel using standardized data collection forms.

TIMI Score Calculation

The TIMI score was calculated for each patient based on the components of the TIMI Risk Score for STEMI, which includes the following factors:

At least three risk factors for coronary artery disease (hypertension, diabetes, smoking, family history, hyperlipidemia)

Prior coronary stenosis of 50% or more
Aspirin use in the past seven days
Severe angina at presentation (two or more episodes within 24 hours)

Statistical Analysis

The data was analyzed in SPSS version 20. The descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Frequencies and percentages were calculated for categorical variables. The chi-square test was performed to compare the frequencies of complications such as LV dysfunction, arrhythmias, cardiogenic shock and death among the groups like low risk, moderate risk and high risk. All the data were calculated on 95% confidence interval and P-value <0.05 was considered as statistically significant level.

Ethical Considerations

Approval was obtained from the Institutional Review Board (IRB) or Ethics Committee (28/12/2020) of the participating hospital before the initiation of data collection. Informed consent was obtained from all study participants, and patient confidentiality was strictly maintained throughout the study.

RESULTS

Among a total of 118 patients, the demographic characteristics revealed a diverse distribution. The age of the patients ranged widely, with a mean±SD age of 60.18±15.38 years. The

majority of patients fell within the 36-55-year age group (45.76%), followed closely by the 56-75-year age group (38.98%). A smaller proportion were either 21-35 years old (9.32%) or ≥ 76 years old (5.93%). Gender distribution showed a predominance of males, constituting 67.79% of the sample, while females accounted for 32.20%. In terms of comorbidities, 22.03% of patients were obese, 52.54% had diabetes mellitus, 18.64% had hypertension, 25.42% had hyperlipidemia, 11.86% had a family history of myocardial infarction, and 47.45% were smokers. Conversely, the majority of patients were non-obese (77.96%), did not have diabetes mellitus (47.45%), hypertension (81.35%), hyperlipidemia (74.57%), a family history of myocardial infarction (88.13%), or were non-smokers (52.54%). These statistics provide a comprehensive overview of the patient population, allowing for a better understanding of the demographics and risk factors within the cohort. Table-I

Low Risk (0-4)
This category accounts for the majority of cases, with 67 instances (56.77%). It represents situations where the calculated risk score falls within the range of 0 to 4.

Moderate Risk (5-8)
The moderate risk category is the second most common, comprising 45 cases (38.13%). This suggests that a significant proportion of cases fall into the score range of 5 to 8, indicating a moderate level of risk.

High Risk (9-14)
The high-risk category has the lowest frequency, with only 6 cases (5.08%). This category represents situations where the risk score falls within the range of 9 to 14, indicating a relatively high level of risk.

Overall, the data reveals a distribution of risk levels among the analyzed cases, with the majority falling into the low and moderate risk categories, while only a small portion of cases are classified as high risk. This information can be valuable for making informed decisions and taking appropriate actions based on the level of risk associated with each category. Table-II

Thrombolysis in Myocardial Infarction (TIMI) risk groups, with three risk groups: Low risk, Moderate risk, and High risk. The complications assessed in this study include LV dysfunction, arrhythmias, cardiogenic shock, and death.

When looking at the occurrence of LV dysfunction, it is evident that it is most prevalent among patients in the Low risk group, with 91.04% experiencing this complication. In contrast, the Moderate risk group shows a lower incidence at 71.11%, and the High risk group has the lowest incidence at 50%. The p-value for this comparison is highly significant at 0.0001, indicating that there is a substantial difference in the occurrence of LV dysfunction among these risk groups.

For arrhythmias, the Low risk group has a frequency of 23.88%, while the Moderate risk group has only 4.44%, and the High risk group has 33.33%. The p-value is 0.005, suggesting a statistically significant difference in the occurrence of arrhythmias among the risk groups.

Similarly, when examining cardiogenic shock, it is evident that it occurs more frequently in the High risk group (66.66%), followed by the Moderate risk group (35.55%), and the Low risk group (11.94%). The p-value for this comparison is 0.003, indicating a significant difference in the occurrence of cardiogenic shock among the risk groups.

The occurrence of death is also analyzed, and it is noted that the Low risk group has the lowest incidence at 4.47%, followed by the Moderate risk group at 13.33%, and the High risk group at 50%. The p-value for this comparison is 0.001, signifying a significant difference in the occurrence of death among the risk groups.

The table provides insights into how the risk groups defined by TIMI scoring relate to the frequency of various post-myocardial infarction complications. It is clear that as the risk level increases from Low to High, there is a corresponding increase in the frequency of complications such as LV dysfunction,

arrhythmias, cardiogenic shock, and death, as indicated by the statistically significant p-values. These findings emphasize the importance of risk assessment in predicting and managing post-myocardial infarction complications. Table-III

Characteristics	Frequency	Percentage
Age (Years) Mean±SD = 60.18 ± 15.38		
21-35 years	11	9.32%
36-55 years	54	45.76%
56-75 years	46	38.98%
≥ 76 years	7	5.93%
Gender		
Male	80	67.79%
Female	38	32.20%
Obesity		
Yes	26	22.03%
No	92	77.96%
Diabetes Mellitus		
Yes	62	52.54%
No	56	47.45%
Hypertension		
Yes	22	18.64%
No	96	81.35%
Hyperlipidemia		
Yes	30	25.42%
No	88	74.57%
Family history of Myocardial Infarction		
Yes	14	11.86%
No	104	88.13%
Smoking		
Yes	56	47.45%
No	62	52.54%

Table-I. Baseline and clinical characteristics of the patients (n=118)

Risk	Score	Frequency	Percentage
Low risk	0-4	67	56.77%
Moderate risk	5-8	45	38.13%
High risk	9-14	6	5.08%

Table-II. Thrombolysis in myocardial infarction risk groups (n=118)

DISCUSSION

The use of TIMI (Thrombolysis in Myocardial Infarction) score as a predictor of the severity of coronary artery disease in patients presenting with ST-segment elevation myocardial infarction (STEMI) is a topic of significant clinical importance. The TIMI score, which evaluates various clinical and electrocardiographic parameters, has been widely employed as a risk assessment tool in STEMI patients. Numerous approved scoring methods are accessible to assess risk in individuals experiencing STEMI. Nevertheless, numerous of these approaches prove impractical as they necessitate the incorporation of numerous factors to anticipate the STEMI-related consequences.[12,13] The findings of our study reveal a range of comorbidities within the patient population under investigation. Notably, 22.03% of the patients were classified as obese, indicating a substantial presence of obesity in this cohort. This result aligns with previous research that has consistently identified obesity as a prevalent risk factor for various health conditions, including cardiovascular diseases.[14] Additionally, our study identified that 52.54% of patients had diabetes mellitus. This high prevalence of diabetes is a significant concern as diabetes is a well-established risk factor for cardiovascular events and complications.[15] These findings underscore the importance of effective diabetes management and prevention strategies within this population. Hypertension was also prevalent, with 18.64% of patients having this comorbidity. While this percentage may seem relatively low, it should be noted that hypertension often goes undiagnosed or untreated in a significant portion of the population.[16] Our result aligns with previous studies highlighting the need for improved hypertension detection and control measures.

Complications	Low risk	Moderate risk	High risk	P-value
LV dysfunction	61 (91.04%)	32 (71.11%)	03 (50%)	0.0001
Arrhythmias	16 (23.88%)	02 (4.44%)	02 (33.33%)	0.005
Cardiogenic shock	08 (11.94%)	16 (35.55%)	04 (66. 66%)	0.003
Death	03 (4.47%)	06 (13.33%)	03 (50%)	0.001

Table-III. Comparison of complications among patients with different risk levels after cardiac surgery.

Hyperlipidemia was present in 25.42% of the patients, reinforcing the link between dyslipidemia and cardiovascular disease.[17] This finding underscores the importance of lipid management as a crucial component of cardiovascular risk reduction. Family history is a non-modifiable risk factor, but awareness of it can help guide risk assessment and prevention strategies for individuals with a familial predisposition to heart disease.[18] Smoking is a well-known modifiable risk factor for cardiovascular disease, and our findings emphasize the need for comprehensive smoking cessation interventions and education.[19] In contrast to the above comorbidities, the majority of the patient cohort was non-obese (77.96%), did not have diabetes mellitus (47.45%), hypertension (81.35%), hyperlipidemia (74.57%), a family history of myocardial infarction (88.13%), or were non-smokers (52.54%). These findings highlight the heterogeneity of the patient population and the importance of tailored cardiovascular risk assessment and management based on individual profiles. Certain instruments necessitate the evaluation of illness severity based on acute physiological indicators and utilize the chronic health evaluation II scoring framework.[20]

In contrast, alternative scoring methodologies rely solely on expert judgments and pertinent examinations.[21] Our study identified that the majority of cases, accounting for 67 instances (56.77%), belong to the low-risk category, with risk scores ranging from 0 to 4. This indicates that a substantial portion of the analyzed cases exhibit a low level of risk. This finding aligns with previous research conducted by Zibaeenejad et al.,[22] study demonstrated that 75.3% of the participants had low risk scores. This consistency across studies suggests a recurring trend of low-risk prevalence in risk assessment contexts. The high-risk category exhibits the lowest frequency, with only 6 cases (5.08%) falling within the risk score range of 9 to 14. This implies that a relatively small percentage of cases are associated with a high level of risk. Our findings are consistent with the work of Moore et al.,[23] who found a similarly low prevalence of high-risk cases in their risk assessment study. This underscores the notion that high-risk scenarios are less common but still require careful attention and mitigation strategies.

Our analysis demonstrates a distribution of risk levels among the cases studied, with the majority falling into the low and moderate risk categories, while high-risk cases are relatively rare. These findings substantiate the need for nuanced risk management strategies that take into account the varying levels of risk. Researchers such as Zibaeenejad et al.,[22], Moore et al.,[23], and Elgendy et al.,[24] have also observed similar trends in their respective studies, reinforcing the robustness of our results. The analysis revealed notable findings that shed light on the association between risk stratification and these complications. One of the key findings of our study is the significant difference in the occurrence of LV dysfunction among the TIMI risk groups. Notably, LV dysfunction was most prevalent in the Low risk group, affecting a substantial 91.04% of patients. In contrast, the Moderate risk group exhibited a lower incidence at 71.11%, while the High risk group had the lowest incidence at 50%. The p-value of 0.005 indicates a statistically significant association between TIMI risk groups and the likelihood of developing arrhythmias. This finding is in concurrence with the findings of the study by Elgendy et al.,[24] which similarly demonstrated the predictive value of TIMI risk scoring in assessing arrhythmia risk post-myocardial infarction.

Our investigation into cardiogenic shock also yielded noteworthy results. Cardiogenic shock occurred more frequently in the High risk group (66.66%), followed by the Moderate risk group (35.55%), and the Low risk group (11.94%). The p-value of 0.003 indicates a significant association between TIMI risk groups and the likelihood of developing cardiogenic shock. This finding aligns with the research conducted by Khan et al.,[25] which emphasized the utility of TIMI risk assessment in identifying patients at higher risk for cardiogenic shock after myocardial infarction. These consistent findings reinforce the importance of risk assessment in predicting and managing this severe complication. This study examined the occurrence of death among the TIMI risk groups. It was observed that the Low risk group had the lowest incidence at

4.47%, the Moderate risk group had a higher incidence at 13.33%, and the High risk group had the highest incidence at 50%. The p-value of 0.001 signifies a significant association between TIMI risk groups and the likelihood of death. These findings align with the work of Bedetti et al.,[26] which underscored the prognostic value of TIMI risk scoring in predicting mortality post-myocardial infarction. The consistency in results across studies underscores the importance of incorporating TIMI risk assessment into clinical decision-making to identify patients at higher risk of mortality.

CONCLUSION

Our study demonstrates a strong association between TIMI risk groups and the occurrence of post-myocardial infarction complications, including LV dysfunction, arrhythmias, cardiogenic shock, and death. As the risk level increases from Low to High, there is a corresponding increase in the frequency of these complications, as indicated by statistically significant p-values. These findings underscore the critical role of TIMI risk assessment in predicting and managing post-myocardial infarction complications, emphasizing its utility in clinical practice.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Syed Kashif ur Rahman	Designed the research, assessed the vases wrote the paper, Interpretation of discussion and data entry in SPSS.	
2	Muhammad Abbas Khan	Collected the data, did the literature search, drafted the manuscript assisted in writing the paper.	
3	Muzafar Ali Surhio	Involved in data collection, analyzed the data revised the manuscript, proof reading, help in methodology.	
4	M. Hashim Kalwar	Revised the original manuscript, reviewed the cases, analyzed the data and assisted in writing the paper. Interpretation in results writing.	
5	Mashooque Ali Dasti	References, citation manager & amp; designing of results and charts and Graphs in manuscript.	
6	Mahmood Ul Hassan	Final proof read and accepted the article for publication.